



US006360719B1

(12) **United States Patent**
Uitenbroek

(10) Patent No.: **US 6,360,719 B1**
(45) Date of Patent: **Mar. 26, 2002**

(54) **CHARGE CONTROL DEVICE FOR AND METHOD FOR CONTROLLING THE FUNCTIONING OF A RECIPROCATING INTERNAL COMBUSTION ENGINE**

(75) Inventor: **Paul Uitenbroek, Kohlscheid (DE)**

(73) Assignee: **Nonox B.V. (NL)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/743,403**

(22) PCT Filed: **Jul. 5, 1999**

(86) PCT No.: **PCT/EP99/04660**

§ 371 Date: **Feb. 8, 2001**

§ 102(e) Date: **Feb. 8, 2001**

(87) PCT Pub. No.: **WO00/03131**

PCT Pub. Date: **Jan. 20, 2000**

(30) **Foreign Application Priority Data**

Jul. 8, 1998 (DE) 198 30 575

(51) Int. Cl.⁷ **F02D 9/14; F02D 9/16**

(52) U.S. Cl. **123/399; 123/336; 123/337; 123/80 R; 123/190.1**

(58) Field of Search **123/399, 336, 123/337, 308, 432, 80 R, 190.1**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,738,233 A	• 4/1988	Hitomi et al.	123/403
4,802,452 A	• 2/1989	Kanesaka	123/403
4,892,071 A	• 1/1990	Asayama	123/336
4,932,378 A	• 6/1990	Hitomi et al.	123/308
5,325,829 A	• 7/1994	Iwasiuk	123/336
5,718,198 A	• 2/1998	Adamisin et al.	123/308
5,778,851 A	• 7/1998	Schellhase et al.	123/337
5,803,045 A	• 9/1998	Adamisin et al.	123/336

* cited by examiner

Primary Examiner—Erick Solis

(74) *Attorney, Agent, or Firm*—R. W. Becker & Associates; R. W. Becker

(57) **ABSTRACT**

A charge control apparatus and a method for operating a reciprocating internal combustion engine are provided. The charge control apparatus includes a rotary disc valve disposed in the intake conduit upstream of the intake valve and connected to a motor and a control unit. The rotary disc valve is movable by the motor between a position in which the rotary disc valve closes the intake conduit and a position in which it permits flow along the intake conduit to the intake valve. The control unit controls the movement of the rotary disc valve into its closing position in the intake conduit such that the closing time point of the rotary disc valve is set increasingly ahead of the closing time point of the intake valve as a function of decreasing performance demands.

15 Claims, 9 Drawing Sheets

